

**DECLARATION OF DAVID WAGNER**

I, **DAVID S. WAGNER**, based on my own observation, knowledge, and experience, hereby declare as true and accurate the following:

1. I have no financial interest in the CIBO or Dominique Gilles' invention, the RCI disc, which is the subject of U.S. patent application 10/578,256.
2. Specifically, I worked as an engineer with non-woven industrial abrasives from February 1981 to June 2003 at Standard Abrasives (1981-2000) and Vector Five, LLC (2000-2003).
3. I was Chief Engineer at Standard Abrasives (1981-1985) and was promoted to VP of R&D and Engineering (1985-2000). During that time, 3M bought our key supplier of non-woven belt material which we used to convert to abrasive products. As a result of losing this key supplier, I was directed by the CEO to build a manufacturing facility to allow Standard Abrasives to vertically integrate in the non-woven abrasives market. My initial methodology was to reverse engineer non-woven abrasive products, research non-woven abrasive patented technology, establish analytical and testing capabilities, and finally to develop proprietary technology owned by Standard Abrasives. Before 3M acquired Standard Abrasives in 2007, Standard Abrasives was 3M's only competitor in the United States with a domestic manufacturing capability for industrial non-woven abrasives.
4. Overall, I have over thirty years of experience in industry. My experience includes engineering management, batch and process production, cost and capacity analysis, facility development, industrial goods distribution, technology implementation, and ISO 9001 certification for a non-woven abrasive manufacturing facility. I also conducted technical training in the manufacture and use of industrial non-woven abrasives for domestic and international clients for new markets in Europe and Asia.
5. In my experience, significant training is required since most engineers lack training or experience with coated and non-woven abrasive wheels or discs. For example, many engineers typically lack training in abrasives, although they usually have competencies in other areas. Thus, they need to be educated on the wide range and types of abrasives available and which products have the best efficacy for the intended work. The choices available include coated abrasive belts, discs, wheels, paper products, and non-woven abrasives. Each type of product and its various forms have specific applications for which



- they are best suited. Tool selection is also determined by the type of material intended to be abraded.
6. Engineers that do have training in abrasives will know the inherent differences between an abrasive wheel as opposed to a disc. They would know that either a disc or a wheel can be used for finishing or stock removal and that discs impart a circular scratch pattern, and a wheel results in a linear scratch pattern.
  7. Development engineers on my team at Standard Abrasives typically asked customers about problems in the use of abrasive products in their production process for areas that they would like to see improved. A development engineer had to have a Bachelor of Science in Mechanical Engineering or Chemistry. The development engineer's job was to identify new non-woven abrasive applications and/or products that had economic potential.
  8. Since Standard Abrasives was the only competitor to 3M manufacturing non-woven industrial abrasives having U.S. domestic manufacturing capabilities, and as its former Chief Engineer and VP of R&D and Engineering, I have the personal knowledge and qualifications to speak on the topic of non-woven abrasives.
  9. To give some added perspective, there are two basic types of industrial abrasive fabrics: coated abrasives and non-woven abrasives ("non-wovens"). Coated abrasives are constructed by adhering abrasive grain onto either a paper or textile substrate. Paper products are generally used on wood products and supplied as discs or sheets. Heavy grades of paper-based fiber substrates are also used in the manufacture of discs for metal-working. Abrasive grains adhered to textile substrates are generally manufactured to be used as belts or discs. The textile substrates can be constructed of either cotton or synthetic fibers and are initially designed and typically used as an endless belt on a belt sanding machine. The construction of coated abrasive products incorporates the textile substrate to allow the product to perform while experiencing high-tensile forces attendant with use on belt machines. The durability those textiles provide also render possible use of the material as discs. Those discs may be secured to a rotary driver by an adhesive, a mechanical attachment, or Velcro.
  10. I reviewed the CIBO application 10/578,256. Realizing that the invention used 0.75 to 0.85 mm diameter non-woven fibers, I was immediately surprised because it goes against conventional sizing for an abrasive product using both coated and non-woven material.



11. CIBO's non-woven specification (0.75 mm to 0.85 mm) can have more and larger sanding grains adhered to it and by virtue of its non-woven components and it offers also a degree of compressibility.
12. I reviewed the Teetzel prior art (U.S. Patent 4,275,529) reference cited by the Examiner in Dominique Gilles' case.
13. I noticed that Teetzel relies on 3M's Very Fine grade non-woven material, Scotch-Brite.
14. It is common in the abrasives industry to make non-wovens with substantially a 15 denier standard. Non-woven 15 denier equals approximately 0.04 mm, or 40 microns. CIBO's diameter of 0.75 mm to 0.85 mm is considered enormous and highly unconventional for use in an abrasive product that incorporates both coated abrasives and non-woven material. Teetzel's patent teaches the use of the non-wovens to optimize the coated abrasive grain efficiency via the non-woven material's compressibility, but the grains of the coated abrasive are the active abrading component, not the non-woven. Teetzel does not teach using the non-wovens as an active abrading component. The non-wovens in Teetzel therefore did not have to have any sanding grains because the grain efficiency was controlled by the non-woven compressibility—not by the presence of any grain on the non-woven. To support my conclusion in interpreting the benefits and dynamics of Teetzel's teachings, it is notable that Teetzel uses a substantially smaller grain specification in the non-woven (280 grit) compared to the sanding component—the coated abrasive (which uses 180 or 80 grit). If the non-wovens in Teetzel were for abrading, the non-wovens would logically have a grain size consistent with the coated abrasive grain size (for example, to match the 180 or 80 grit). In CIBO's invention, the combination of coated abrasive and large fiber diameter of the non-wovens is unconventional. The presence of a scrim non-woven in a combination product is unconventional, as in CIBO's disc.
15. The vast majority of tools employed by industry to drive abrasive products have constant RPM motors: either electric or pneumatic. A crucial and central aspect of the Teetzel's wheel is it *does* change Surface Feet Per Minute as the wheel's outside diameter is constantly shrinking as the wheel does its work and is expended by the same process. Any optimum SFPM based on initial compaction as taught by Teetzel cannot be sustained and is only attainable for a small fraction of the wheel's useable life as a result of the wheel being driven at a constant RPM. Notably Teetzel was forced to use a variable speed lathe in generating



his data to compensate for the wheel's natural attrition while performing work. Using variable speed lathes is not a practical option in industry and are infrequently used because of their large size and narrow range of shape of objects they can accommodate. Manufacturing processes that use variable speed lathes for surface finishing and deburring are rare. The majority of devices used in industry to drive abrasive products, as mentioned, are either hand held electric or pneumatic motors. An abrasive wheel will continue to change its SFPM due to its natural attrition. A disc, however, provides constant SFPM when driven by a constant speed motor owing to its completely different design and usage.

16. CIBO's disc does not shrink in diameter and therefore has a constant Surface Feet Per Minute (SPFM).
17. Teetzel teaches the benefit of grain efficiency and how it can be controlled by compaction. However, the huge range of compaction taught by Teetzel is not useful, with ratios of 15:1 to 1:5 sandpaper to non-woven fiber. Further, the data presented in Teetzel supporting the purported grain efficiency does not specifically identify the sand paper flap to non-woven fiber ratio. To further invalidate the utility of the Teetzel data, it was tested on a variable speed lathe. As stated, flapwheels are not intended to be, nor in practice, commonly used in this manner. One view is that Teetzel is well suited for lathes; however, the disc of the present invention represents a much higher degree of end-user freedom as it is intended and designed to be used on a portable hand held tool.
18. A fundamental principle in Teetzel is that the contact area of each flap in the wheel is controlled by total flap density, or compaction: the fewer the flaps, the greater the flex of the flap's tip possible for a given applied force. The greater the flex, the greater the contact area between the flap and the workpiece. As the wheel undergoes its natural attrition, the flex becomes less (as each flap is shortened) and the compaction becomes greater (same number of flaps in a diminishing outside diameter ("OD") of the wheel) which further restricts flex and affects grain efficiency. The contact area of the disc is determined by the end-user and the angle of attack created between the face of the disc and the workpiece. With the CIBO disc, the end-user has much greater control in SFPM being constant or an optimum depending on the specifics of the disc's speed and material being abraded.
19. Teetzel identifies the non-woven flap material as a "Very Fine" or finer 280 aluminum oxide flap (ScotchBrite Type A). The construction of that material uses substantially a fiber on the



order of denier 15. The density of nylon is 1.07 grams/cm<sup>3</sup>. The fiber diameter of Teetzel's "Very Fine" aluminum oxide non-woven can be calculated as follows:

$$\begin{aligned} \text{Volume "V" of a fiber is calculated by } \pi * r^2 * \text{length.} \\ V = (3.14)r^2(\text{length}) \text{ and } V = \text{mass} / \text{density} = \text{grams} / (\text{grams/cm}^3) \\ (15 \text{ grams} / 1.07 \text{ grams/cm}^3) = (3.14)r^2 (9000 \text{m} \times 100 \text{cm/m}) \\ (14.02 \text{ cm}^3) / (3.14 \times 900,000 \text{ cm}) = r^2 \\ 4.96 \times 10^{-6} \text{ cm}^2 = r^2 \\ .0022 \text{ cm} = r \\ r = .0223 \text{ mm} \end{aligned}$$

20. The radius is doubled to obtain the diameter. Thus, the fiber diameter of the "Very fine" aluminum oxide non-woven taught by Teetzel is 0.045 mm. CIBO's invention has much larger fiber diameter of 0.75 to 0.85 mm. Teetzel's teaching of fiber diameter is 20 times smaller. Again, this is highly unconventional for a product comprised of both coated and non-woven abrasive product (CIBO's invention). That fiber size gives CIBO's invention much more tensile strength.
21. While the basic construction of textile-reinforced coated abrasives are designed for belt applications, looking now to CIBO's invention, those properties that make the material successful as a belt also provide the necessary requirements to perform as a disc, notably the capability to withstand high tensile loads while in use.
22. "Non-wovens" or "non-woven abrasives" were configured as substrates in the early 1960's for use as abrasive products (Hoover U.S. Pat. No. 2,958, 593). As the name implies, the material is not woven and is manufactured as a web with a multiplicity of intertwined synthetic fibers, notably polyester or nylon. Even though the non-woven material lacks any significant tensile strength it found application as sheets, discs, and wheels. Non-woven characteristics provided properties not available in historic coated abrasive materials: pliability, conformability, and a controlled aggression when abrading.
23. As the technology evolved, belt applications were desired but the pure non-wovens, as mentioned, lacked the tensile strength to adequately perform on belt machines. This problem was solved by introducing a woven fabric onto one side of a non-woven roll. The woven fabric was attached to the non-woven roll and was also constructed of nylon or polyester. It is referred to as a "scrim."

24. The scrim allowed the non-woven to be made into belt configurations and also disc applications where the disc's edge and outer circumference was subjected to sharp edges. In disc usage, the scrim acted as a tough and durable re-enforcement enabling the disc's edge (which is the typical preferred contact area) to withstand sharp burrs and jagged metal edges such as weldments. A wide range of products soon followed and scrimmed non-wovens were successful in industrial applications in the form of belts, wheels, sheets, and discs of various sizes.
25. One of the earliest configurations for non-scrim, non-woven was the construction of a wheel, known in the trade as a flapwheel or flapbrush. This is the type wheel described in the patent assigned to the 3M Corp. by Teetzel. Teetzel teaches the construction of a wheel using both non-woven (no scrim, i.e., not reinforced) abrasive and coated abrasive leaves. Teetzel discusses the benefits of particular leaf densities in obtaining stock removal.
26. However, CIBO's application is of a completely different design. It teaches the construction not of a wheel, but of a disc.
27. The non-woven material in CIBO's invention incorporates a scrim non-woven and is substantially different in design and use. The Teetzel wheel relates to a non-woven having a construction of very fine grain (the specification cited is ScotchBrite Type A Very Fine 280 grit) and is substantially constructed of 15 denier fibers. All of Teetzel refers only to a "wheel."
28. I know from my investigations reverse engineering 3M products that 3M's Scotch-Brite Type A Very Fine is a manufactured non-woven material of 15 denier fibers. This is highly conventional and I as such is the reason Teetzel elected to use this specification in his invention. CIBO goes against this convention by using much heavier fibers that are typical of belt reinforced material.
29. CIBO's invention is not a wheel. It is a disc and imparts an entirely different scratch pattern. As a disc, it is employed in distinct industrial applications not suitable or preferred for flapwheels. CIBO's invention additionally incorporates substantially larger fibers owing to the fact the invention is intended to be used as a disc and is subject to extreme edge attrition. The inclusion of a non-woven scrim provides the durability other non-woven abrasive products lack. Due to the larger fiber size, CIBO's invention has greater thermal resistance from the heat during abrasion.



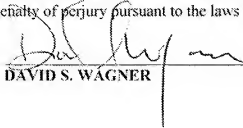
30. The scrim's inherent durability is the reason why it has never been used in a wheel. It does not lend itself to a wheel configuration, because its resistance to attrition will quickly render the wheel non-productive. In particular, the sanding grains in such a wheel would be expended before the fibers are eroded. The scrim's high durability is the reason the scrim is not used in other combination wheels such as Teetzel's, (the combination being coated and non-woven). CIBO's disc invention uses the scrim (large fiber diameter, non-woven). The scrim is a detriment to an abrasive wheel's performance. The scrim does not wear away and the abrasive grains adhered to the non-wovens would not perform any more work in a wheel configuration. The attrition of the grain needs to match the attrition of the non-woven material, to allow the entire structure (the wheel) to wear down uniformly. With a large fiber diameter, the grains would have a higher attrition rate than the fibers. Teetzel lacks the scrim, which follows the conventional approach of using unreinforced non-wovens in wheels. The ScotchBrite Very Fine Type A in Teetzel's wheel is an unreinforced material. The abrasive face of the non-woven scrim in CIBO's disc invention is unique in this respect. It is the only abrasive product to my knowledge that incorporates a non-woven scrim with coated abrasives.
31. Furthermore, CIBO's use of much larger denier fibers also provides for much coarser grains than available in non-re-enforced non-wovens. Limits are put on the size of grain that can adhered to a given fiber diameter. The ScotchBrite Very Fine incorporates, as stated in Teetzel, a very fine grain of a 280 specification. Teetzel's coated abrasive uses a 180 and 80 grit specifications. The determinant for Teetzel's wheel life is the coated abrasive, not the non-woven. The Very Fine non-woven of Teetzel gives compressibility for determining grain efficiency of the coated abrasive leaves in his wheel, which grits are identified as 180 and 80 grits. Through CIBO's use of the scrim, and larger fibers, larger grains can be adhered for more efficient stock removal.
32. Flapwheels, such as described in Teetzel's patent, are not constructed of non-wovens using a scrim because that material will not undergo leaf attrition necessary to expose fresh grain. What prevents that desired attrition is the presence of the scrim as being a tough and durable substrate that resists disintegration. However, in disc form, those characteristics are highly favorable and desirable for a long lasting, economical disc. The use of both a textile coated abrasive in conjunction with a conformable, scrim non-woven provides CIBO's invention



with unique stock removal characteristics and finishing properties not attainable with a flapwheel or flapbrush.

By signing below, I hereby certify that the above is true and correct to the best of my knowledge under penalty of perjury pursuant to the laws of the State of California and of the United States.

Signed:

  
DAVID S. WAGNER

Date:

Jan 12, 2020